CLAIMS

We Claim:

1. A hetero phase polymeric composition, comprising:
   a) a polypropylene component, present in said hetero phase polymer composition as a continuous phase, said polypropylene component having a melting point, Tm $\geq$ 110° C;
   b) a modifier component, said modifier component being a dispersed phase in said hetero phase polymer composition, said modifier component including at least 10 percent by weight of the total modifier component being an ethylene α-olefin polymer having a density $\geq$ 0.905 g/cm^3;
   c) a compatibilizer component, present in said hetero phase polymer composition in a compatibilizing amount, said compatibilizer component having a Δ Hf < 45 J/g, said compatibilizer component having propylene sequences co-crystallizable with the polypropylene component of a).

2. The hetero phase polymer composition of claim 1, wherein said polypropylene component is an impact copolymer (ICP) of propylene and an α-olefin, said ICP having one or more of a Tm > 115° C, a Δ Hf > 60 J/g, or a total α-olefin content of < 70 weight percent; said α-olefin being one of ethylene, butene-1, 4 methyl-1-pentene, hexene-1, octene-1, decene-1, ondecene-1, dodecene-1 or combinations there of; and wherein said polypropylene component is one of isotactic, syndiotactic, atactic, or combinations thereof.

3. The hetero phase polymer composition claim 2, wherein said polypropylene component has one or more of a Tm > 125° C, a Δ Hf of > 80 J/g, or an α-olefin content of > 2 wt. % or < 50 wt. %, based on the total weight of said polypropylene component, and wherein said α-olefin

being one or more of ethylene, butene-1, 4 methyl-1-pentene, hexene-1, octene-1.

4. The hetero phase polymer composition claim 3, wherein said polypropylene component has one or more of a Tm > 130° C, a Δ Hf of > 85 J/g; or an α-olefin content of > 2 wt. % or < 40 wt. %, based on the total weight of said polypropylene component, and wherein said α-olefin being one or more of ethylene, butene-1, hexene-1, octene-1.

5. The hetero phase polymer composition of claim 4, wherein said polypropylene component has one or more of a Tm > 135° C, a Δ Hf of > 90 J/g; or an α-olefin content of > 2 wt. % or < 30 wt. %, based on the total weight of said, and wherein said α-olefin is ethylene.

6. The hetero phase polymer composition of claim 5, wherein said polypropylene component has one or more of a Tm > 140° C, a Δ Hf of > 95 J/g; or an α-olefin content of > 2 wt. % or < 25 wt. %, based on the total weight of said polypropylene component, said polypropylene component having a molecular weight in the range of from 10,000 to 5,000,000, said polypropylene component having a melt flow rate (MFR), in the range of 15 - 60 g/10 min; said ICP including a homopolymer polypropylene and rubber, said rubber being present in said ICP in the range of from 4 - 20 wt. %, based on the total weight of said ICP, said rubber having an α-olefin content of 25 - 70 weight %.

7. The hetero phase polymer composition of claim 6, wherein said modifier component is a single polymer or a blend of two or more ethylene α-olefin polymers, said α-olefin being one of propylene, butene-1, 4-methyl-1-pentene, hexene-1, octene-1, decene-1, ondecene-1, dodecene-1 or combinations thereof, said α-olefin or α-olefins present in said ethylene α-olefin polymer or polymers < 20 mole %, in each if two or more are

present, said modifier component being substantially devoid of propylene crystallinity.

8. The hetero phase polymer composition of claim 7, wherein said compatibilizer component and said polypropylene component have substantially the same stereoregularity, chosen from one of isotactic, syndiotactic, atactic, or combinations there of; said compatibilizer component being a propylene α- olefin polymer having one or more α-olefin comonomers present in said compatibilizer component, said α-olefins selected from one or more of ethylene or an α-olefin having 4 - 12 carbon atoms.

9. The hetero phase polymer composition of claim 8, wherein said compatibilizer component has a crystallizable portion and an amorphous portion, said amorphous portion being the result of one of stereo error introduced by a catalyst or by the amount and nature of a comonomer.

10. The hetero phase polymer composition of claim 9, wherein said compatibilizer component is a polymer of propylene and one or more of ethylene, butene-1, 4-methyl-1-pentene, hexene-1, octene-1, and decene-1.

11. The hetero phase polymer composition of claim 10, wherein said compatibilizer component is a polymer of propylene and one or more of ethylene, butene-1, hexene-1, or octene-1; wherein said compatibilizer component has a crystallinity defined by a melting point (Tm) < 105° C, and/or a Δ Hf < 35 J/g, and/or a Mooney viscosity ML (1+4)@125° C < 100, said compatibilizer component has a narrow compositional distribution, such that > 75 wt. % of the compatibilizer component may be isolated in a thermal fractionation, in 2 adjacent soluble fractions, where each fraction differs < 20 % from the average weight present α-olefin of the total compatibilizer component; wherein said polypropylene

component is present in said hetero phase polymer composition in the range of from 70 - 90 wt. %; said modifier component is present in said hetero phase polymer composition in the range of from 10 - 25 wt. %; and said compatibilizer component being present in said hetero phase polymer composition in the range of from 0.1 - 8 wt. %; said weight percents of a), b) and c), being based on the total polymer weight of said hetero phase polymer composition.

12. The hetero phase polymer composition of claim 11, wherein said compatibilizer component has a crystallinity defined by a melting point (Tm) < 100° C, and/or a Δ Hf < 25 J/g, and/or a Mooney viscosity ML (1+4)@125° C < 75; wherein said polypropylene component is present in said hetero phase polymer composition in the range of from 80 - 90 wt. %; said modifier component is present in said hetero phase polymer composition in the range of from 15 - 22 wt. %; and said compatibilizer component being present in said hetero phase polymer composition in the range of from 0.1 - 5 wt. %; said weight percents of a), b) and c), being based on the total polymer weight of said hetero phase polymer composition.

13. A process for preparing a hetero phase polymer composition of claim 12, comprising:

mixing the components a) b) and c), melt mixing said a) b) and c) at a high intensity for a time to form said hetero phase composition.

14. A two phase polymer blend comprising:

a) a polypropylene component present as a continuous phase, said polypropylene component having a Tm > 110° C or a Δ Hf > 60 J/g, and wherein said polypropylene component has crystallinity from one of isotactic or syndiotactic sequences;

b) a modifier component, present in said polymer blend at ≤ 10 weight percent, based on the total polymer weight of said blend,

said modifier component having a density in the range of from 0.85 - 0.965 g/cm^3; and

c) a compatibilizer component, present in said blend at a compatibilizing amount, said compatibilizer component having a Δ Hf $<$ 45 J/g, said compatibilizer component having propylene sequences that co-crystallize with the polypropylene component of a).

15. The two phase polymer blend of claim 14, wherein said modifier component is present in said blend at $\leq$ 9.5 weight percent, and a melt index in the range of from 0.1 - 10 g/10 minutes, 190° C, said modifier component being an ethylene α-olefin polymer including ethylene and an α-olefin selected from an α-olefin having 3 - 12 carbon atoms.

16. The two phase polymer blend of claim 15, wherein said modifier component is present in said blend at $\leq$ 9.0 weight percent, and wherein said α-olefin is selected from one or more of propylene, butene-1, 4-methyl-1-pentene, hexene-1, octene-1, decene-1, ondecene-1, dodecene-1 or combinations thereof.

17. The two phase polymer blend of claim 16, wherein said α-olefin is selected from one or more of butene-1, hexene-1, or octene-1, said α-olefin being present in said ethylene α-olefin polymer at $<$ 20 mole percent. .

18. The two phase polymer blend of claim 17, wherein said modifier component is a blend of two or more ethylene α-olefin polymers, with the proviso that if more than one polymer makes up the modifier component, α-olefin selected and amount contained may be the same or different in each, as well as the same or different densities.

19. The two phase polymer blend of claim 18, wherein said polypropylene component has a Tm > 110° C or a Δ Hf > 60 J/g, and a polydispersity index (PDI) in the range of from 1 - 40, and wherein said modifier component is substantially free of propylene crystallinity.

20. The two phase polymer blend of claim 19, wherein said polypropylene omponent is an impact copolymer (ICP) of propylene and an α-olefin, said ICP having one or more of a Tm > 115° C, a Δ Hf > 70 J/g, or a total α-olefin content of < 70 weight percent; said α-olefin being one of ethylene, butene-1, 4 methyl-1-pentene, hexene-1, octene-1, decene-1, ondecene-1, dodecene-1 or combinations there of; and wherein said polypropylene component is one of isotactic, syndiotactic, atactic, or combinations thereof.

21. The two phase polymer blend of claim 20, wherein said polypropylene component has one or more of a Tm > 125° C, a Δ Hf of > 80 J/g, or an α-olefin content of > 2 wt. % or < 50 wt. %, based on the total weight of said polypropylene component, and wherein said α-olefin being one or more of ethylene, butene-1, 4 methyl-1-pentene, hexene-1, octene-1.

22. The two phase polymer blend of claim 21, wherein said polypropylene component has one or more of a Tm > 130° C, a Δ Hf of > 85 J/g; or an α-olefin content of > 2 wt. % or < 40 wt. %, based on the total weight of said polypropylene component; and wherein said α-olefin being one or more of ethylene, butene-1, hexene-1, octene-1.

23. The two phase polymer blend of claim 22, wherein said polypropylene component has one or more of a Tm > 135° C, a Δ Hf of > 90 J/g; or an α-olefin content of > 2 wt. % or < 30 wt. %, based on the total weight of said, and wherein said α-olefin is ethylene.

24. The two phase polymer blend of claim 23 wherein said polypropylene component has one or more of a Tm > 140° C, a Δ Hf of > 95 J/g; or an α-olefin content of > 2 wt. % or < 25 wt. %, based on the total weight of said polypropylene component, said polypropylene component having a molecular weight in the range of from 10,000 to 5,000,000, said polypropylene component having a melt flow rate (MFR), in the range of from 15 - 60 g/10 min; said ICP including a homopolymer polypropylene and rubber, said rubber being present in said ICP in the range of from 4 - 20 wt. %, based on the total weight of said ICP, said rubber having an α-olefin content of 25 - 70 weight %, said ICP having a PDI in the range of from 1 - 40.

25. The two phase polymer blend of claim 24, wherein said compatibilizer component and said polypropylene component have substantially the same stereoregularity, chosen from one of isotactic, syndiotactic, atactic, or combinations thereof; said compatibilizer component being a propylene polymer having one or more α-olefin comonomers present in said compatibilizer component, said α-olefins selected from one or more of ethylene or an α-olefin having 4 - 12 carbon atoms.

26. The two phase polymer blend of claim 25, wherein said compatibilizer component has a crystallizable portion and an amorphous portion, said amorphous portion being the result of one of stereo error introduced by a catalyst or by the amount and nature of a comonomer.

27. The two phase polymer blend of claim 26, wherein said compatibilizer component is a polymer of propylene and one or more of ethylene, butene-1, 4-methyl-1-pentene, hexene-1, octene-1, and decene-1.

28. The two phase polymer blend of claim 27, wherein said compatibilizer component said compatibilizer component is a polymer of propylene and

one or more of ethylene, butene-1, hexene-1, or octene-1; wherein said compatibilizer component has a crystallinity defined by a melting point (Tm) < 105° C, and/or a Δ Hf < 35 J/g, and/or a Mooney viscosity ML (1+4)@125° C < 100, said compatibilizer component has a narrow compositional distribution, such that > 75 wt. % of the compatibilizer component may be isolated in a thermal fractionation, in 2 adjacent soluble fractions, where each fraction differs < 20% from the average weight present α-olefin of the total compatibilizer component; wherein said polypropylene component is present in said hetero phase polymer composition in the range of from 70 - 90 wt. %; said modifier component is present in said hetero phase polymer composition in the range of from 15 - 25 wt. %; and said compatibilizer component being present in said hetero phase polymer composition in the range of from 0.1 - 8 wt. %; said weight percents of a), b) and c), being based on the total polymer weight of said hetero phase polymer composition.

29. The two phase polymer blend of claim 28, wherein said compatibilizer component has a crystallinity defined by a melting point (Tm) < 100° C, and a Δ Hf < 25 J/g, a Mooney viscosity ML (1+4)@125° C < 75; wherein said polypropylene component is present in said hetero phase polymer composition in the range of from 80 - 90 wt. %; said modifier component is present in said hetero phase polymer composition in the range of from 15 - 20 wt. %; and said compatibilizer component being present in said hetero phase polymer composition in the range of from 0.1 - 5 wt. %; said weight percents of a), b) and c), being based on the total polymer weight of said hetero phase polymer composition.

30. A hetero phase polymer composition, comprising:

a) a polypropylene having polypropylene crystallinity, due to the presence of one of isotactic or syndiotactic sequences in said polypropylene;

b) an ethylene α-olefin polymer being substantially free from propylene crystallinity, having a density of ≥ 0.905 g/cm^3; and

c) a polymer compatibilizer having propylene crystallinity substantially the same as that in a).

31. A two phase polymer composition, comprising:

a) an impact copolymer of propylene (ICP), said ICP having one or more of Tm > 140° C, Δ Hf > 95J/g, or an α-olefin content of one of > 2 or < 25 weight percent, a molecular weight in the range of from 10,000 - 5,000,000, a melt flow rate in the range of from 15 - 60 dg/min., said ICP present in said two phase polymer composition in the range of from 70 - 90 weight percent;

b) an ethylene α-olefin copolymer, wherein said α-olefin is one or more of butene-1, hexene-1, or octene-1, said ethylene copolymer having a density ≥ 0.905 g/cm^3, said ethylene copolymer may be a blend of two or more ethylene α-olefin copolymers, and if a blend, the aggregate density is ≥ 0.905 g/cm^3, said ethylene α-olefin copolymer being present in said two phase polymer composition in the range of from 15 - 22 weight percent, having an melt index in the range of from 0.1 - 10 g/10 minutes;

c) a compatibilizer component present in said two phase polymer composition in the range of 0.1 - 8 weight percent, said compatibilizer component is a polymer of propylene and one or more of ethylene, butene-1, hexene-1, or octene-1, said compatibilizer component has a crystallinity defined by one of Tm < 100° C, or a Δ Hf < 25 J/g, wherein said compatibilizer component has a narrow compositional distribution, such that > 75 wt. % of the compatibilizer component may be isolated in a thermal fractionation, in 2 adjacent soluble fractions, where each fraction differs < 20% from the average weight present α-olefin of the total compatibilizer component.

32. A hetero phase polymeric composition, comprising:

a) a polypropylene component present in said hetero phase polymer composition as a continuous phase, said polypropylene component having a melting point Tm ≥ 100° C;

b) a modifier component, ethylene α-olefin polymer component, said modifier component being a dispersed phase in said hetero phase polymer composition, and comprising at least 10 % by weight of the total modifier component of an polymer derived from ethylene and an alpha-olefin having from 4 to 20 carbon atoms with a density of at least 0.88 g/cm^3 and crystallinity sufficient for determination of the CDBI with a CDBI of at least 50 %;

c) a compatibilizing amount of a compatibilizer component, derived to an extent of at least 50 mole % of propylene compatibilizer component and having a Δ Hf < 45 J/g which is co-crystallizable with the polypropylene component.